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Automated Fingerprint Identification System (AFIS) Latent Print Process

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Purpose

In this briefing, Mr. Kasey Wertheim, a certified latent print examiner at our DoD Biometrics Fusion Center, provides a basic introduction to the latent fingerprint process. To learn more about biometrics, please visit http://www.biometrics.dod.mil

John D. Woodward, Jr.
Director, DoD Biometrics

Background

"Latent" versus Inked Prints

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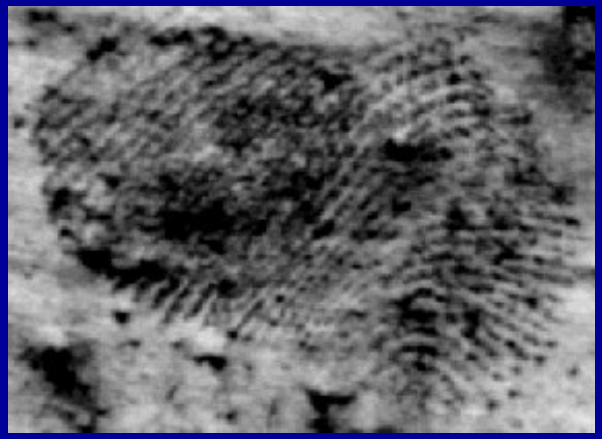

- Latent: "hidden"
- Left by "chance"
- Composed of residue
- Reproduction of friction ridge detail

- Known: "Inked" or live scan
- Recorded intentionally
- Composed of ink / electronic
- Reproduction of friction ridge detail

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Development of Latents

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- Types of evidence
  - Non-Porous
    - Metal
    - Glass
    - Plastic
  - Porous
    - Paper
    - Cardboard
    - Wood

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Development of Latents

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- **Processes used**
  - **Porous**
    - **Cyanoacrylate fuming**
    - **Dye staining**
    - **Fingerprint powder**
  - **Non-Porous**
    - **Ninhydrin**
    - **Diazafluoren-9-one (DFO)**
    - **Physical developer**

***Many* others**

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Capture of Latents

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- Flatbed scanner
- Digital camera

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Capture of Latents

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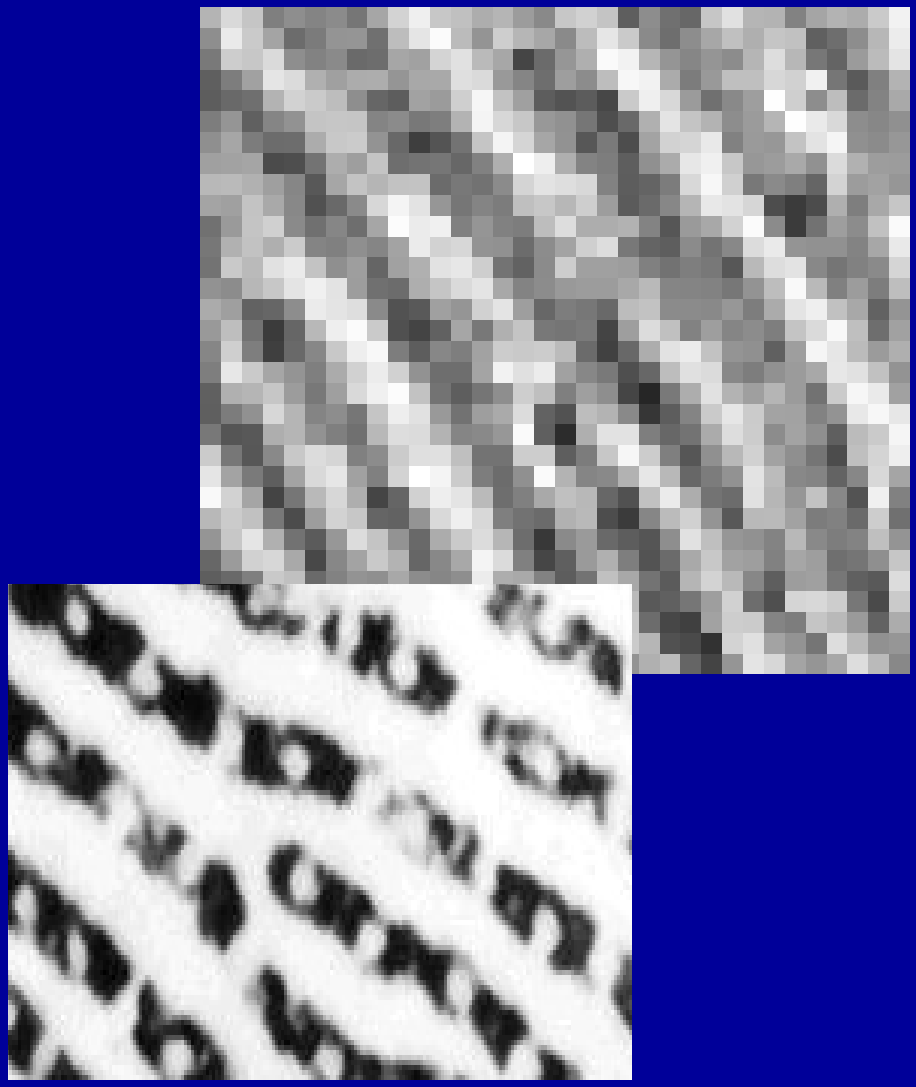
- **Scanner issues**
  - **Resolution setting**
    - **1,000 ppi**
  - **Format settings**
    - **256 grayscale**
    - **.bmp images**
    - **Enhancement settings off**



Background
Capture of Latents

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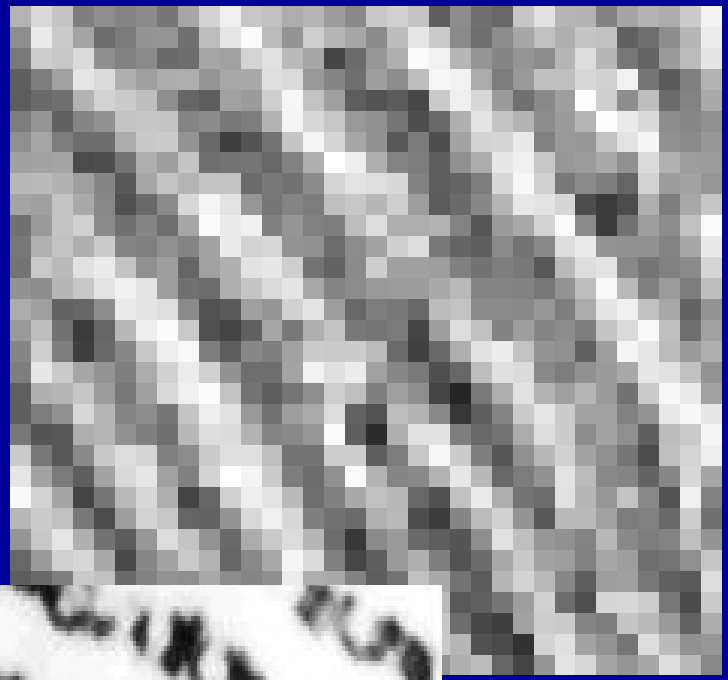
- **Camera Capture Issues**
  - Resolution is variable
  - Format (.bmp or .tif necessary)
  - Camera quality to achieve goal (macro if available, megapixel setting for 1,000 ppi)
  - Distance from surface (close as possible)
  - Angle to surface (perpendicular)
  - *Must* have a scale in photo (for re-sizing)
  - Finger rotation (straigh up or rotate image later)



Latent Processing
Repository Issues

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- Quality of the repository is critical
- “Latent cognizant” repository
  - Rolled
  - 10 fingers
- Priority of latent searching
  - Limited by system parameters
  - Limited by timeliness of the examiners comparing the results

Latent Processing

Formatting a Captured Latent

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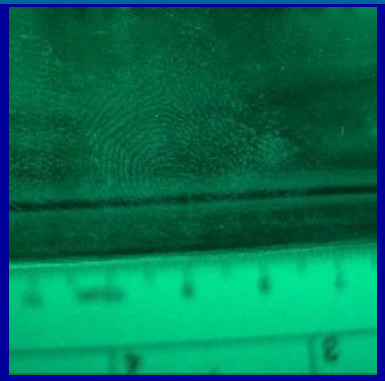
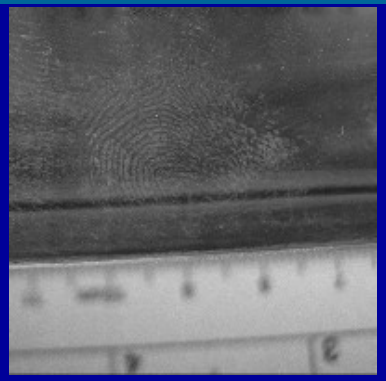
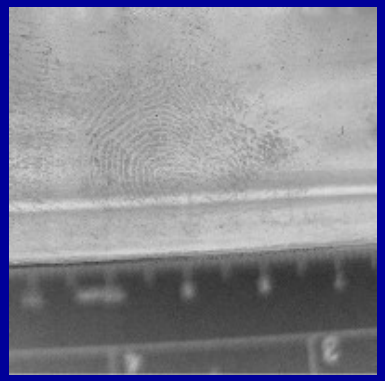
- **Digital captures start as unformatted images**

1) Change to 256 grayscale
2) Black ridges / light furrows
3) Enhanced (brightness/contrast)
4) Sized 1:1
5) Re-sampled to 1,000 ppi
6) Rotated to correct up-and-down orientation
7) Cropped to only the fingerprint
8) Save in the bitmat (.bmp) file format



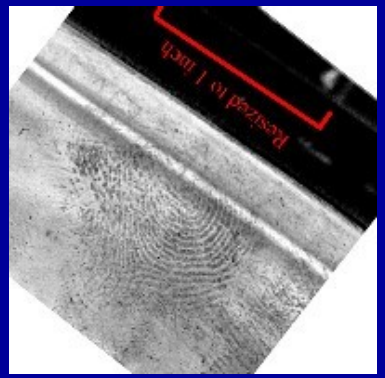


1

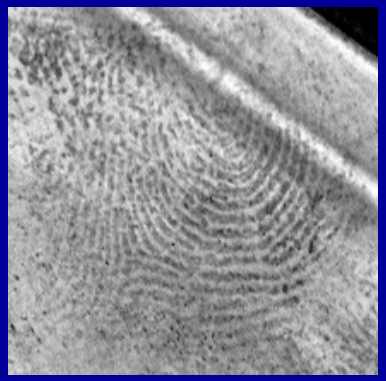


2

3-5



6



7

- **Milestone: Format 1 Formatted Image**

Latent Processing

Formatting a Captured Latent

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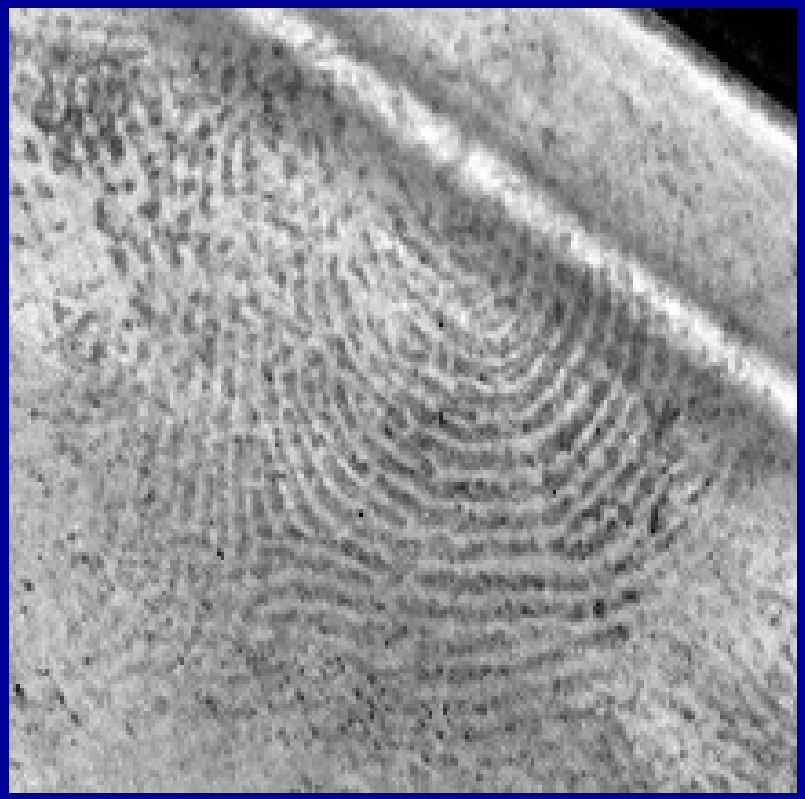
- Open in specialized software
- Enter case information
- Save as formatted latent fingerprint image search file (enables automated AFIS submission)



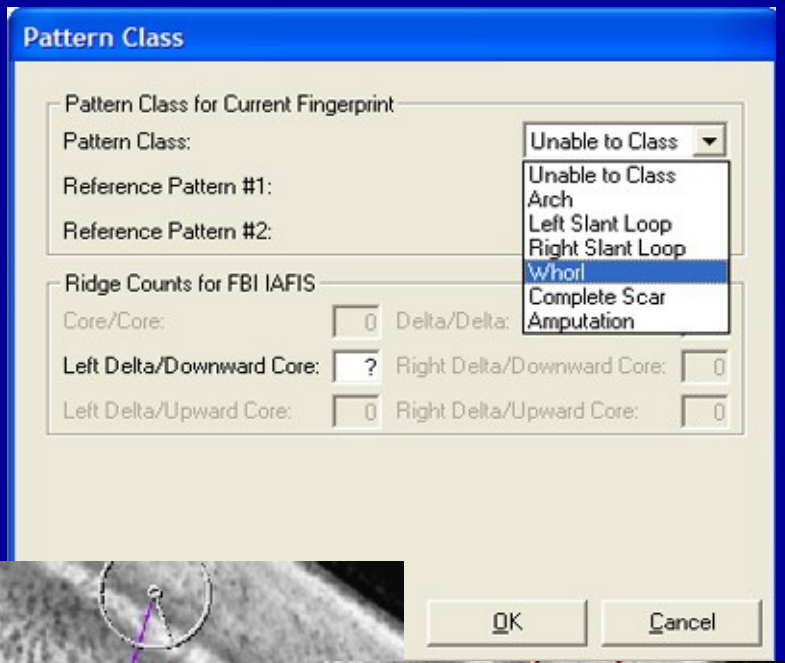
- **Milestone: Format 2 "Image Search"**

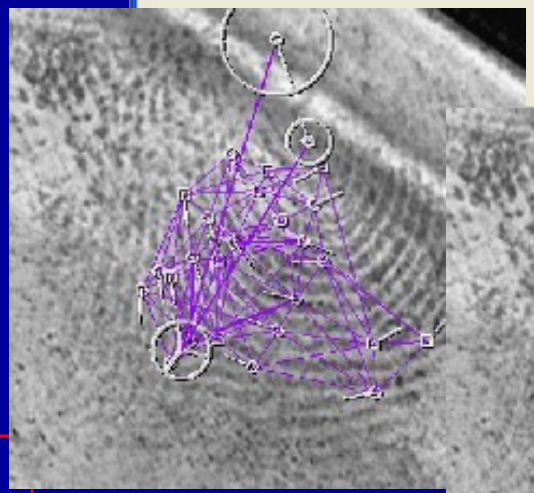
- Can be automatically sent to an AFIS
- Algorithms locate unique detail (not as accurate as human encoding)

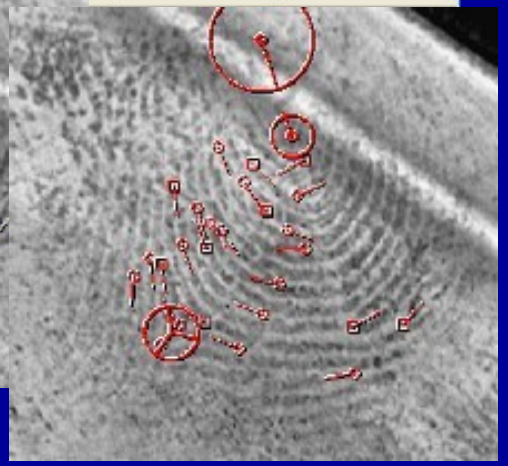
Latent Processing

Formatting a Captured Latent

- Open in AFIS software
- Auto-plot minutia (optional)
- Manually plot minutia
- Encode core(s)
- Encode delta(s)
- Enter information
- Finger position
- Pattern classification
- Minutia ridge counts
- Core-to-delta ridge count
- Enter transaction information
- Enter case information







- **Milestone: Format 2 "Feature Search"**

Latent Processing

Message Sent to AFIS

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- Usually from a client terminal through a network connection to the main AFIS system
- AFIS conducts search processing
- AFIS generates response file
  - Traditional AFIS processing has returned candidate lists from AFIS latent fingerprint searches back to the client terminal for comparison
  - AFIS allows for response files to be sent to a latent service agency for resolution of a text “hit” or “no-hit” repsonse, which is forwarded to the submitter. This allows for non-experts to submit latent print searches from mobile devices and receive hit responses in the field.
- Non-matched latent prints are “registered” to an unsolved latent file
  - Subsequent 10-print searches result in “reverse” latent searches and identifications

Contact Information

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On 27 Dec 2000, the Deputy Secretary of Defense established the Biometrics Management Office and its subordinate unit, the Biometrics Fusion Center, to ensure that biometric technologies are integrated effectively into information assurance systems, physical access control systems, best business practices, and other DoD applications as appropriate.

www.biometrics.dod.mil

Biometrics Management Office

Director – John D. Woodward, Jr.

Became the BMO Director in Oct 2003, coming from the RAND Corporation where he served as a senior researcher. Previously served as CIA Operations Officer.

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- Oversight
- Planning / Budgeting
- Policy & Standards Development
- Acquisition Process
- DoD Requirements Gathering
- Public Outreach
- Liaison with Other Organizations

Biometrics Fusion Center

Director – Sam Cava

Became the BFC Director in Dec 2003, coming from West Virginia University where he was Director, Forensic and Biometric Program Development. Previously served as an Air Force officer.

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- Test & Evaluation
- Biometric Knowledgebase
- Biometric Product List Development
- Repository Management
- Industry/Academia Interface
- Common Access Card (CAC) Support
- Technical Expertise

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